

ANSWERS: Types of Reactions

1) i) $\text{MnO}_4^- / \text{H}^+$ or $\text{Cr}_2\text{O}_7^{2-} / \text{H}^+$

ii) purple \rightarrow colourless, or orange \rightarrow green

iii) 2-methylpropan-1-ol. Since it is a 1° alcohol it can be oxidised to a carboxylic acid / since the others are secondary or tertiary alcohols and can't be oxidised to a carboxylic acid.

2) i) Acid-base / neutralisation

ii) CO_2 gas is a product of the reaction and so bubbles of gas are given off.

iii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COONa}$

3) Chloroethane reacts with $\text{KOH}_{(\text{aq})}$ to form an alcohol in a substitution reaction; Cl is replaced by OH.
 $\text{CH}_3\text{CH}_2\text{Cl} \rightarrow \text{CH}_3\text{CH}_2\text{OH}$

Chloroethane reacts with $\text{KOH}_{(\text{alc})}$ to form an alkene in an elimination reaction; H and Cl removed / HCl formed.

$\text{CH}_3\text{CH}_2\text{Cl} \rightarrow \text{CH}_2 = \text{CH}_2$

Chloroethane reacts with $\text{NH}_3(\text{alc})$ to form an amine in a substitution reaction; Cl is replaced by NH_2
 $\text{CH}_3\text{CH}_2\text{Cl} \rightarrow \text{CH}_3\text{CH}_2\text{NH}_2$

4) $\text{CH}_3 - \text{CH} = \text{CH}_2$

Elimination

5) a) i) **Reaction One**

Reactant A – $\text{H}_2\text{O} / \text{H}^+$ Type – addition

OR $\text{H}_2\text{O} / \text{acid}$

OR concentrated H_2SO_4 then H_2O

OR dilute / aq H_2SO_4

ii) **Reaction Three**

Reactant C – bromine / Br_2 Type – substitution

6) Addition – occurs in alkenes because they have double bonds. Ethene is an alkene so will undergo addition reactions. The chlorine (molecule) will add (across the double bond.)

$\text{CH}_2 = \text{CH}_2 + \text{Cl}_2 \rightarrow \text{CH}_2\text{Cl} - \text{CH}_2\text{Cl}$

Substitution occurs in alkanes (because they have single bonds). Ethane is an alkane, so will undergo substitution reactions. One hydrogen atom will be removed from the molecule and one chlorine atom will take its place. UV light is required for the process.

$\text{CH}_3 - \text{CH}_3 + \text{Cl}_2 \rightarrow \text{CH}_2\text{Cl} - \text{CH}_3 + \text{HCl}$

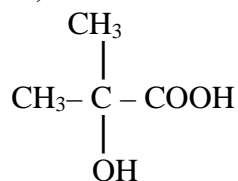
7) i) CH_3COOH

(accept ethanal, if its full structure is given)

ii) CH_3COONa or CH_3COO^-



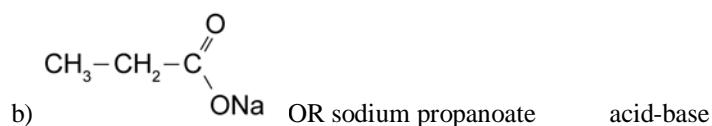
iv)



Alcohol reacts with $\text{Cr}_2\text{O}_7^{2-}$ / is oxidised to form carboxylic acid.

This must be a (carboxylic) acid because it reacts with sodium carbonate.

The tertiary OH group isn't oxidised by acidified dichromate/only the primary OH / OH on the end carbon is oxidised / reacts



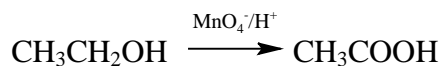
9) In both reactions, a colour change from purple to colourless will be seen as purple $\text{MnO}_4^- / \text{H}^+$ is reduced to Mn^{2+} .

(OR colour change from purple to brown precipitate if non-acidified MnO_4^- .)

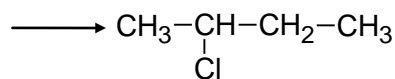
Ethene will react to form a diol,
ethan-1,2-diol:



Ethanol will react to form a carboxylic acid, ethanoic acid:

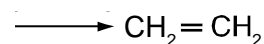


10) a)



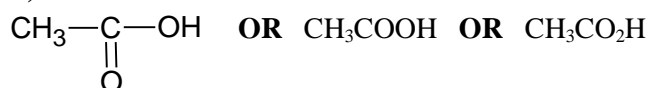
Addition involves a small molecule (HCl) joining onto adjacent carbon atoms of an unsaturated molecule. The double bond breaks / molecule becomes less unsaturated / becomes saturated.

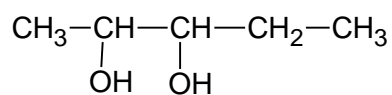
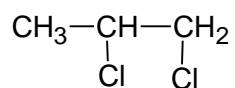
b)



Elimination involves the removal of two [substituents](#) / groups / H & OH / water / on neighbouring C atoms in a molecule. A double bond forms / forms an alkene / the molecule becomes less saturated.

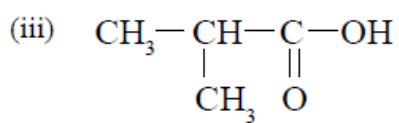
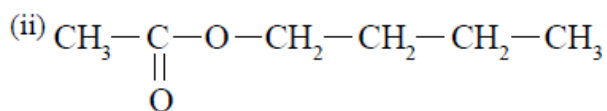
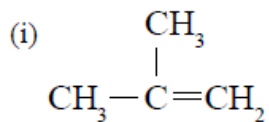
11)





12) Conc. sulfuric acid / conc. H_2SO_4

13)a)



b) $\text{MnO}_4^- / \text{H}^+$ Purple to colourless.